

***Legionella* PROTOCOL**

Public Health Action

1. Educate providers and laboratories to report cases of legionellosis to the local health department in the patient's county of residence within one week of diagnosis.
2. Educate providers about appropriate diagnosis of legionellosis.
3. Conduct an appropriate investigation as follows:
 - a. *For sporadic cases:* Complete the front of the yellow card and the CDC Legionellosis Case Report Form and attach copies of laboratory reports. For cases who travelled in or out of state during the incubation period, notify the West Virginia Infectious Disease Epidemiology Program (IDEP) immediately.
 - b. *For small clusters (two or more cases linked by person, place, and time):* Interview patients to identify all activities and places that they have been within the two to 10 days prior to onset. Initiate active surveillance to identify additional cases. Contact IDEP immediately.
 - c. *For large outbreaks (\geq five cases):* Initiate active surveillance. Consult IDEP immediately.

Disease Control Objective

Prevent additional cases of legionellosis by early recognition and investigation of outbreaks of legionellosis so that control measures can be applied in a timely fashion.

Disease Prevention Objectives

There is very little that can be done to prevent sporadic cases of legionellosis at the community level. Early identification of outbreaks can prevent occurrence of additional cases if a thorough investigation is performed and a common source is identified.

Surveillance Objectives

1. To determine the incidence of legionellosis in West Virginia.
2. To identify demographic characteristics of persons with legionellosis.
3. To detect any increase in the number of cases of legionellosis or any unusual clustering of cases.

Public Health Significance

Legionnaires' disease accounts for two to 15% of cases of community acquired pneumonia. Due to difficulty with diagnosis and ready availability of broad spectrum antibiotics effective against *Legionella*, the disease is often under-diagnosed and under-reported.

Since the dramatic outbreak at the American Legion Convention in Philadelphia in 1976, large community based outbreaks and nosocomial outbreaks of legionellosis have been documented. Mortality ranges from five to 15%; higher mortality rates have occurred in nosocomial outbreaks. Outbreaks have been recognized in association with cooling towers, potable water, whirlpools, humidifiers, fountains, grocery store misters, and other sources of water aerosol.

Clinical Description

Legionellosis is a bacterial disease that is more common in adults over the age of 50 and is extremely rare in those under age 20. Most cases occur in males, with an estimated male:female ratio of 2.5:1. *Legionella* can cause two clinically distinct syndromes: Legionnaires' disease and Pontiac fever.

Legionnaires' disease is a type of pneumonia which may be accompanied by fever, cough, and chest pain. Classified among the atypical pneumonias, early symptoms may include low grade fever, malaise, anorexia, headaches, and myalgias. Gastrointestinal symptoms are sometimes prominent in the early phase of illness and may lead to delayed recognition. Patients with severe disease may progress to stupor, respiratory failure, and multiorgan failure. The case-fatality rate may be as high as 39% in some hospitalized patients.

By contrast, Pontiac fever results in flu-like symptoms that spontaneously resolve without treatment in two to five days. This syndrome is usually recognized only in association with outbreaks.

The table below provides a quick comparison of the two syndromes:

| Legionnaire's Disease | Pontiac Fever |
|---|--|
| <ul style="list-style-type: none">• Incubation period of 2-10 days• Atypical pneumonia• Older individuals with chronic underlying conditions• Mortality 5-39%• Low attack rate (5%) | <ul style="list-style-type: none">• Mean incubation period of 36 hours• Influenza-like illness• Healthy young adults• Self-limited illness• High attack rate (95%) |

Etiologic Agent

Legionellae bacteria is associated with Legionnaires' disease and Pontiac fever. Forty-three species of *Legionella* with at least 65 serogroups have been identified. *Legionella pneumophila* serogroup 1 is most commonly associated with disease.

Reservoir

This bacteria has been isolated in water from hot water systems, air conditioning cooling towers, evaporative condensers, humidifiers, whirlpool spas, respiratory therapy devices, decorative fountains, hot and cold water taps and showers, and hot tubs. *Legionella* has also been isolated in creeks, ponds, and soil from their banks. Testing of environmental

sources is expensive and should not be undertaken unless the source is implicated through an epidemiological investigation.

Mode of Transmission

Legionella transmission is airborne through contaminated aerosols and possibly through aspiration of contaminated water. There is no person-to-person transmission.

Incubation Period

The incubation period for Legionnaires' disease is two to 10 days, usually five to six days. The incubation period for Pontiac fever is five to 66 hours, usually 24 to 48 hours.

Infectious Period

Legionella is not transmitted person-to-person.

Outbreak Recognition

Outbreaks of *Legionella* pneumonia have been associated with contaminated cooling towers and evaporative condensers, showers, decorative fountains, humidifiers, respiratory therapy equipment, and whirlpool spas. Outbreaks may present to public health as reports of increased numbers of cases of pneumonia, sometimes without a specific diagnosis. Prompt investigation must include case-finding, case confirmation, and a detailed review of all the patient's activities during the two to 10 days prior to onset of symptoms. These investigations are difficult and time consuming; however, community based outbreaks of legionellosis are associated with substantial mortality, so the quality and timeliness of the investigation is important.

By contrast, outbreaks of Pontiac fever present as an outbreak of influenza-like illness (usually in healthy adults) shortly after a common exposure.

Sporadic cases and outbreaks of *Legionella* are seen more often during the summer and fall, but it is possible for cases of *Legionella* to occur anytime during the year. Multiple outbreaks have been noted among hospitalized patients.

Case Definition for Legionellosis

Clinical Description

Legionellosis is associated with two clinically and epidemiologically distinct illnesses: Legionnaires' disease, which is characterized by fever, myalgia, cough, and pneumonia; and Pontiac fever, a milder illness without pneumonia.

Laboratory Criteria for Diagnosis

- Isolation of *Legionella* from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluids, or

- Demonstration of a four-fold or greater rise in the reciprocal immunofluorescence antibody (IFA) titer to ≥ 128 against *Legionella pneumophila* serogroup 1 between paired acute- and convalescent-phase serum specimens, or
- Detection of *L. pneumophila* serogroup 1 in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody testing, or
- Demonstration of *L. pneumophila* serogroup 1 antigens in urine by radioimmunoassay or enzyme-linked immunosorbent assay.

Case Classification

Confirmed: a clinically compatible case that is laboratory confirmed.

Comment

The previously used category of “probable case,” which was based on a single IFA titer, lacks specificity for surveillance and is no longer used.

Nosocomial Legionella Case Definition

Laboratory confirmed legionellosis that occurs in a patient who has spent ≥ 10 days continuously in the hospital prior to onset of illness is considered **definite** nosocomial Legionnaires’ disease, and laboratory-confirmed infection that occurs two to nine days after hospitalization is **possible** nosocomial infection.

Laboratory Diagnosis

There are multiple tests available to diagnose legionellosis, as summarized in the table below (Am J Med. 2001;110:41-48):

| Test | Specimen | Sensitivity | Specificity | Time to Diagnosis | Comments |
|-----------------------------|----------|-------------|-------------|-------------------|---|
| Culture | Sputum | < 10% | 100% | 3-7 days | Special methods and effort can increase sensitivity |
| | Blood | 0-6% | 100% | 3-7 days | |
| Direct Fluorescent Antibody | Sputum | 33-68% | 99-100% | 1 hour | |
| Antigen detection | Urine | 80-90% | 98-100% | < 1 hour | Prolonged excretion; negative early in diagnosis; only detects type 1 |

| | | | | | |
|----------|---------------------------|---------|---------|---------------------------------------|---|
| Serology | Serum | 60-80% | 95-99% | 6-10 weeks for sero- conversion | Single titers unhelpful |
| PCR | Urine/blood | 75-82% | 90-100% | 2-4 hours | Limited human studies; sensitivity likely to exceed other techniques |
| | Respiratory secretions | 83-100% | 90-100% | 2-4 hours | |

Testing notes:

- At this time, the West Virginia Office of Laboratory Services (OLS) does not offer testing for *Legionella*.
- None of these tests are perfect.
- Physicians may underutilize diagnostic testing for patients with pneumonia; therefore, reported cases may greatly under represent the true burden of disease in the population.
- There is a high prevalence of elevated antibody titers to *Legionella* in the general population; therefore, a single titer is of no value in distinguishing cases from non-cases of *Legionella*. Both IgM and IgG are commonly elevated in healthy controls.
- Seroconversion to *Legionella* may take as long as four weeks after onset. Many cases may be missed if convalescent samples are taken prematurely.
- *Legionella pneumophila* type 1 is the most common serogroup identified in the United States; however, it is also the easiest to test for.
- When testing is available and utilized, numerous serotypes of *Legionella pneumophila* and other *Legionella sp.* are found to be responsible for human disease.

Preventive Interventions

While prevention of legionellosis is not always practical at the community level, much has been written about preventive measures in hospitals. The issue is quite controversial, and there are at least two schools of thought to be considered for hospitals that have had no nosocomial cases of *Legionella* (primary prevention) (MMWR, 1997: 46(RR-1): 1-79).

According to one school of thought, hospitals can institute routine, periodic culturing of the potable water system, and take action if $\geq 30\%$ of samples are positive for *Legionella* species. Actions should include:

- Decontamination of the water supply; and
- Alerting clinicians to test for *Legionella* in patients with suspicious clinical syndromes.

Proponents of this method argue that physicians are more likely to test for legionellosis if *Legionella* is known to be present in the hospital water system. In addition, infrequent culturing of a limited number of water samples on an infrequent basis may be less expensive than routine laboratory diagnostic testing for legionellosis in all patients with

nosocomial pneumonia in hospitals that have never had a case. Others argue that in the absence of cases, the risk from *Legionella* in the water supply is undefined. Other factors, including the proximity of contaminated water to the host, the debility of the host, and the virulence of the strain may be just as, if not more, important.

A second school of thought recommends maintaining a high index of suspicion for legionellosis through appropriate use of diagnostic tests coupled with routine maintenance of cooling towers AND use of only sterile water for nebulization devices. If one definite or two possible nosocomial cases are identified:

- Surveillance should be increased; and
- An environmental investigation should be initiated.

Proponents of this method argue that this offers hospitals flexibility based on patient population and the ability to link environmental *Legionella* with Legionnaires' disease in patients before initiating expensive cleanup.

Methods to clean contaminated water systems include superheating water to 65 °C and flushing each distal outlet for \geq five minutes or hyperchlorination (flushing all outlets with \geq 10 mg/L free residual chlorine). In addition, cleaning of water pipes and cooling systems may be necessary, as well as removal of deadlegs.

Surveillance Indicators

- Proportion of investigations with complete clinical and demographic information.
- Proportion of cases with complete two to 10 day history of high-risk activities and travel.